



HORIZONTAL CLOUDS OR VERTICAL CLOUDS?

Yangang Liu and Peter H. Daum

For presentation at the
Atmospheric Radiation Measurement (ARM) Program
Science Team Meeting,
Louisville, KY
March 30-April 3, 2009

Environmental Sciences Department/Atmospheric Sciences Division Brookhaven National Laboratory

P.O. Box, Upton, NY www.bnl.gov

ABSTRACT

Advances in climate models, cloud parameterizations, and physical understanding call for accurately representing the variability of cloud properties in both horizontal and vertical dimensions. This work compares the similarities, and contrasts the differences between the horizontal and vertical variations of cloud properties, with the focus on the mutual relationships among key cloud microphysical parameters (e.g., cloud liquid water content, droplet concentration and relative dispersion of the cloud droplet size distribution). In-situ aircraft measurements from the MASE and other programs are analyzed. It is shown that the relationships between some of the microphysical properties are just the opposite in the two dimensions, posing the important question of whether horizontal or vertical variability is referred to when relationship between cloud microphysical parameters is the subject of interest. Physical processes (e.g., aerosol, updraft and turbulence) underlying such characteristic differences in these relationships are explored.

NOTICE: This manuscript has been authored by employees of Brookhaven Science Associates, LLC under Contract No. DE-AC02-98CH10886 with the U.S. Department of Energy. The publisher by accepting the manuscript for publication acknowledges that the United States Government retains a non-exclusive, paid-up, irrevocable, world-wide license to publish or reproduce the published form of this manuscript, or allow others to do so, for United States Government purposes.